

FLOOD OF SEPTEMBER 16, 1975 IN THE  
GUAYANILLA VALLEY, PUERTO RICOBy  
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## INTRODUCTION

The flood of September 16, 1975 was the fourth highest of record since 1899. This report provides hydrologic and hydraulic information related to the flood of September 16, 1975, in the Guayanilla Valley. The information presented is a compilation of data recovered by the U.S. Geological Survey, and information provided by residents in the study area.

The Guayanilla Valley (fig. 1) lies on the southwestern coastal plain of Puerto Rico. It is 15.3 miles long and 3.5 miles wide, with an area of 52.5 square miles. It is in the upper part of the flood plain of the Rio Guayanilla. The climate on the coastal plain is semiarid with a mean annual precipitation of 1,140 mm, while in the mountainous area of the southern slopes of the Cordillera Central, the mean annual is 2,030 mm. The average daily temperature ranges from 27°C in the winter to 29°C in the summer.

The most of the valley is dedicated to agriculture, with sugarcane the main crop. Between the early 1960s some heavy and light industry moved into the lower part of the valley starting a trend toward changing the economy to industrial. This trend has created the need to utilize the flood plain to meet the continuous growth of the Guayanilla urban area.

This report provides valuable information for planners and designers in making decisions regarding development of the flood plain in the Guayanilla Valley.

Data are generally referred to in SI (International System) units. The SI units may be converted to inch-pound units by multiplying the units given by the factors shown.

Multiply SI units	By	To obtain inch-pound units
Length		
meter (m)	3.2808	foot (ft)
millimeter (mm)	0.03937	inch (in)
kilometer (km)	0.6214	mile (mi)
Area		
square kilometer (km <sup>2</sup> )	0.3861	square mile (mi <sup>2</sup> )
Discharge		
cubic meter per second (m <sup>3</sup> /s)	35.31	cubic foot per second (ft <sup>3</sup> /s)
Temperature		
degree Celsius (C°)	1.8 C° + 32	degree Fahrenheit (F°)

## RIO GUAYANILLA BASIN

The Rio Guayanilla basin is located on the southwestern slopes of the Cordillera Central (fig. 1). The Rio Guayanilla flows in a southerly direction from the rugged hills through steep slopes into a fan-shaped alluvial valley with milder slopes, and empties into Bahia de Guayanilla in the Caribbean Sea. The basin has a drainage area of 47.9 km<sup>2</sup> at the U.S. Geological Survey gaging station 50124500, and 53.9 km<sup>2</sup> at gaging station 50124000. The total drainage area of the basin is about 80 km<sup>2</sup>.

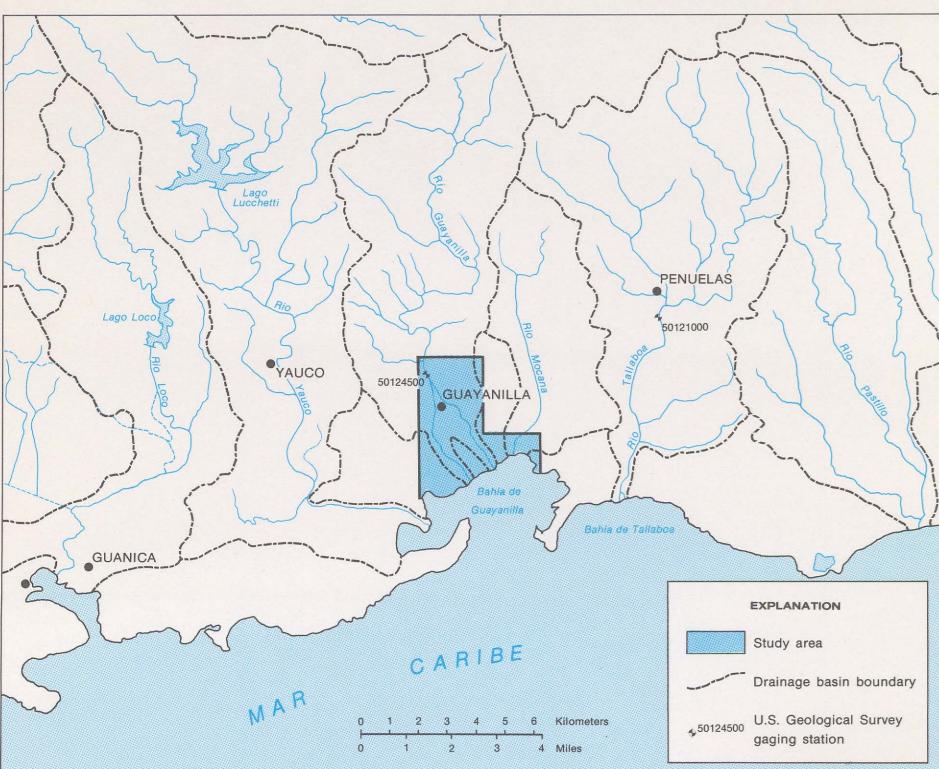
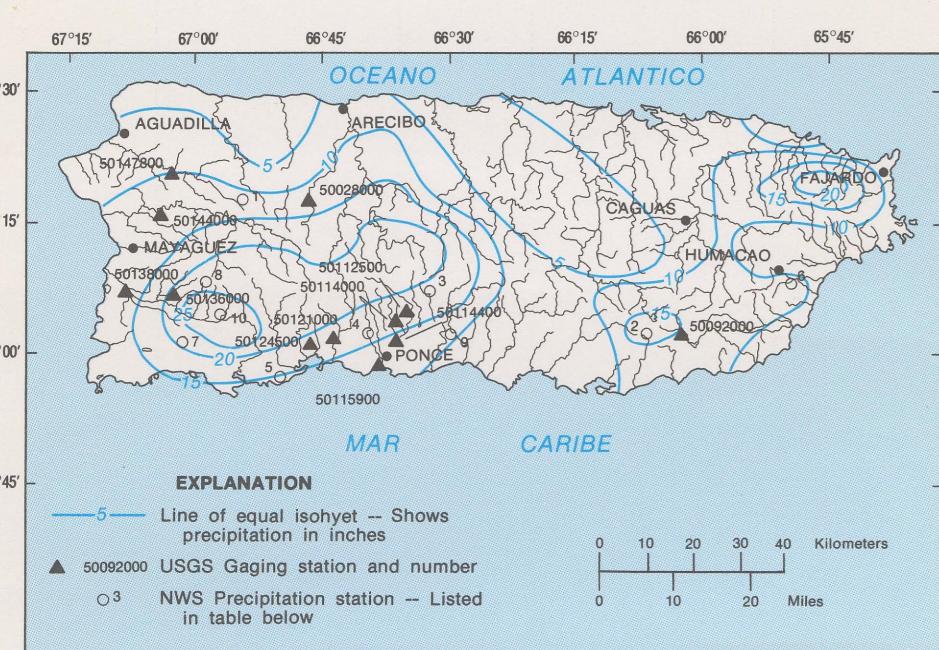


FIGURE 1. - Location of study area and the Rio Guayanilla drainage basin.



FIGURE 5. - Flood height (arrow) at Central Rufina on abandoned house (photograph C).

**FLOOD OF SEPTEMBER 16, 1975**  
The passage of hurricane Eloise near the north coast of Puerto Rico caused torrential rains September 15, 16, and 17, 1975, producing destructive floods mainly in the southwestern part of Puerto Rico. Precipitation at 10 stations during September 15-17, 1975, and the distribution of precipitation throughout the island are shown in figure 2.



NUMBER ON MAP	LOCATION	PRECIPITATION, OF SEPTEMBER 15-17, 1975 IN INCHES			TOTAL
		15	16	17	
1	ADJUNTA SUBSTATION	0.15	11.99	4.87	17.01
2	CARITE PLANT NO. 1	0.05	10.05	6.85	16.95
3	CERRO MARAVILLA	0.46	2.37	18.83	
4	CORRAL VIEJO	0.10	7.58	8.26	15.94
5	ENSON	0.05	5.74	10.30	15.76
6	HUMACO	0.40	8.05	3.24	11.64
7	LAJAS SUBSTATION	0.29	3.10	12.26	15.65
8	MARICAO 2 SSW	2.32	6.05	14.10	22.47
9	MONTE 4E	0.00	2.90	7.78	10.68
10	SABANA GRANDE 2 ENE	1.20	14.00	11.50	26.70

FIGURE 2. - Map of Puerto Rico showing isobars for September 15-17, 1975. Locations of selected precipitation and stream-gaging stations, and table showing the precipitation for the selected stations.

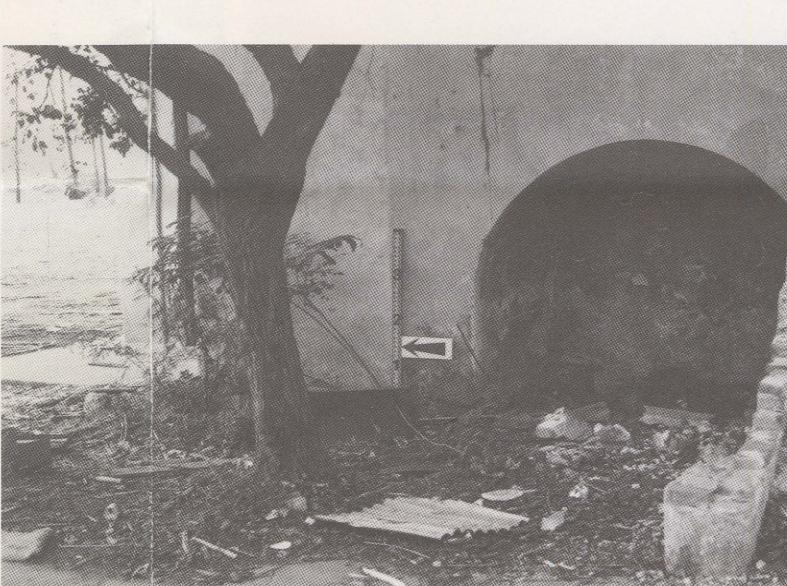


FIGURE 6. - Flood height (arrow) in front of Central Rufina office building (photograph D).



FIGURE 7. - Flood height (arrow) in front of Guayanilla Driving School (photograph E).



FIGURE 8. - Flood height (arrow) at Casa Yarma looking toward old Highway 2 bridge (photograph F).



FIGURE 9. - Flood height (arrow) at barber shop La Moderna looking toward old Highway 2 bridge (photograph G).



FIGURE 10. - Flood height (arrow) in front of Texaco garage A. Figueroa Torres, Inc., sector Los Sitos, Guayanilla (photograph H).

## FLOOD HISTORY

Historical records and interviews with residents in the study area indicated that the valley has experienced severe flooding at least nine times since 1899. The 1899 flood was the highest for which flood elevations could be delineated. Since 1899 major floods occurred in 1938, 1932, 1954, 1958, 1974, 1975, 1976 and 1979.

A stage-discharge relation was developed at station 50124500 (fig. 11). The relation is based on historical data for the period 1899-1975, and current records at the site. The location of gaging stations 50124000 and 50124500, and the indirect-measurement site are shown in figure 12. The difference in drainage area between the indirect measurement site and the gaging stations is insignificant and no correction was applied to the measurement in this analysis.

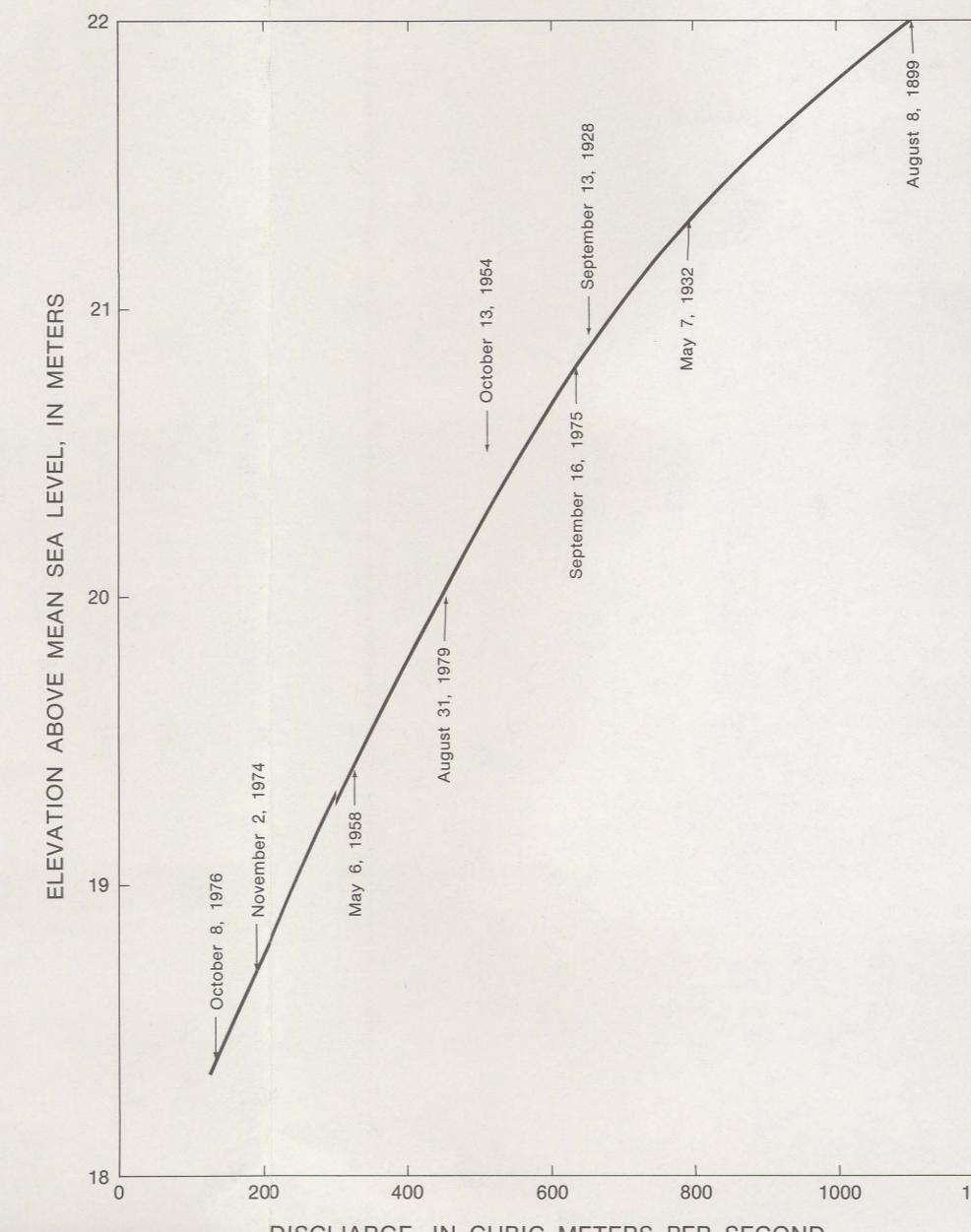


FIGURE 11. - Stage-discharge relation of gaging station 50124500 at Guayanilla, P.R.

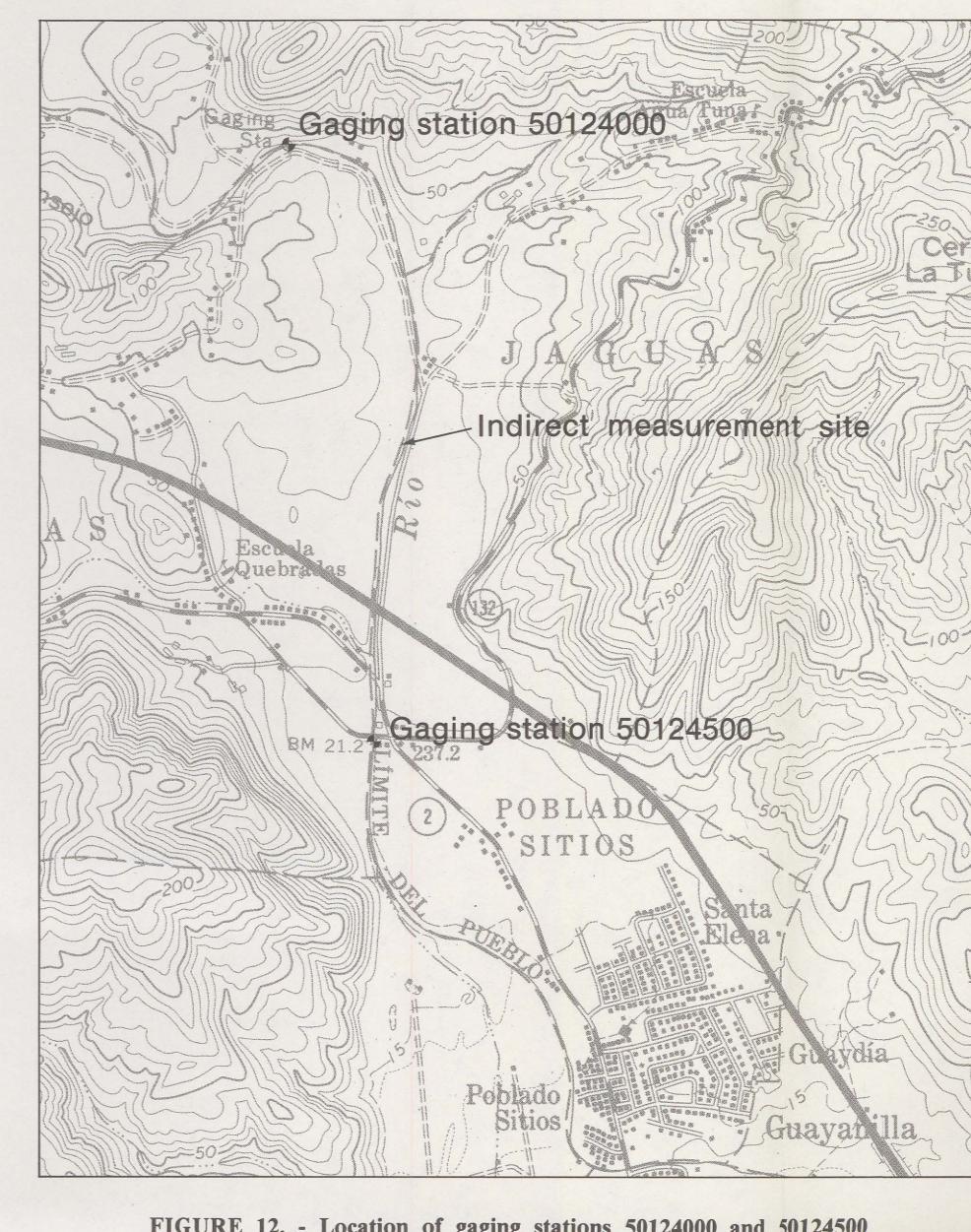


FIGURE 12. - Location of gaging stations 50124000 and 50124500 and indirect measurement site.

## FLOOD FREQUENCY

Historical records were used to define a flow-magnitude frequency relation for Rio Guayanilla at gaging station 50124500. Peak-flow data for this relation were recovered from gaging stations 50124000 and 50124500 which were operated for a total span of 18 years.

Water Resources Council Bulletin 17A (appendix 8, 1977) recommends that the frequency relation at a gage site be defined by a curve of peak discharge for a selected frequency using the station data and data obtained from regional flood magnitude-frequency relation. This was done to relate the data obtained with the 18 years of station data and with results of a regional study accomplished by Lopez and others, 1979. The resulting frequency curve is shown in figure 13. The recurrence intervals shown in table 1 were derived from this figure.

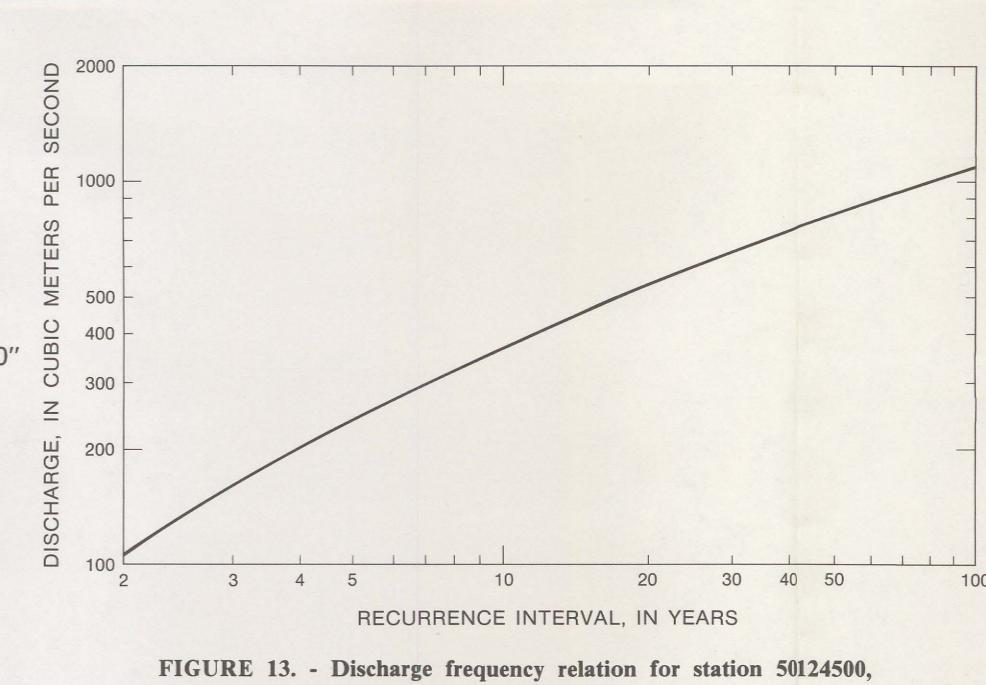


FIGURE 13. - Discharge frequency relation for station 50124500, Rio Guayanilla at Guayanilla, P.R.

## Table 1.—Floods on the Rio Guayanilla at gaging station 50124500

Date	Elevation above mean sea level, meters	Peak discharge, cubic meters per second	Recurrence interval, years
August 8, 1899	22.0	1100	100
September 13, 1928	20.9	650	30
May 7, 1932	21.3	790	46
October 13, 1954	20.5	510	18
May 6, 1958	19.4	330	8
November 2, 1974	18.7	190	4
September 16, 1975	20.8	630	28
October 8, 1976	18.4	150	3
August 31, 1979	20.0	450	14

## FLOOD PROFILES

The profile shown in figure 14 was developed from high-water marks recovered by the U.S. Geological Survey after the flood reached and it represents the water-surface elevation above mean sea level for the September 16, 1975 flood. It is the profile as it was observed on the map. The baseline, and therefore the profile, is not confined to the configuration of the channel but follows a smoother path along the flood plain in the general direction of the floodflow. There are seven bridges over Rio Guayanilla in the study area (table 2). Two of the bridges were destroyed by the flood.

## Table 2.—Elevation of bridges over the Rio Guayanilla in the study area

Map symbol	Stationing along baseline, in kilometers	Location of bridge	Elevation in meters (MSL)	Top deck	Low beam
A	0.98	Old railroad bridge on road to Central Rufina	4.6	3.7	
B	1.50	Abandoned railroad bridge	6.2	5.6	
C	2.30	Old Highway 2 bridge	9.2	8.2	
D	2.85	Old Highway 2 bridge	12.8	12.1	
E	4.18	Old Highway 2 bridge	21.2	20.3	
F	4.52	New Highway 2 bridge	25.5	24.3	

\*Destroyed by the September 16, 1975 flood. The bridge over the auxiliary channel located on the coastline about 650 m east of mouth of Rio Guayanilla was destroyed by the September 16, 1975 flood and is shown on the flood map.

All elevations shown in the study are referenced to mean sea level datum. Permanent reference marks were established at selected points throughout the study area (table 3) and are shown on the flood map.

## COOPERATION AND ACKNOWLEDGMENTS

This report was prepared under a cooperative agreement between the Puerto Rico Department of Natural Resources, the U.S. Army Corps of Engineers, and the U.S. Geological Survey.

ADDITIONAL INFORMATION

Additional information related to this report can be obtained from the U.S. Geological Survey, San Juan District Office, G.P.O. Box 4424, San Juan, Puerto Rico 00936.

## SELECTED REFERENCES

Field, Fred K., 1971, Floods in the Guayanilla-Yauro area, Puerto Rico: U.S. Geological Survey Hydrologic Investigations Atlas HA-414.

Hare, W.J., 1972, Flood of October 5-10, 1970 in Puerto Rico: Puerto Rico Water Resources Bulletin 12, 42 p.

López, M.A., Molina-Díaz, Eloy, and Cobb, E.D., 1979, Floods in Puerto Rico, magnitude and frequency: U.S. Geological Survey Water Resources Investigations 78-141, 66 p.

United States Water Resources Council, 1977, Guidelines for determining flood-flow frequency: Bulletin no. 17A of the Hydrology Committee, 163 p.

## EXPLANATION

Area flooded, September 16, 1975

Boundary of the 1975 flood

Water-surface contour for the 1975 flood, in meters.

Contour interval 1 meter